§ 27.53 Emission limits.

(a) For operations in the bands 2305–2320 MHz and 2345–2360 MHz, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by the following amounts:

(1) *For fixed, land, and radiolocation land stations:* By a factor not less than 80 + 10 log (p) dB on all frequencies between 2320 and 2345 MHz;

(2) *For mobile and radiolocation mobile stations:* By a factor not less than 110 + 10 log (p) dB on all frequencies between 2320 and 2345 MHz;

(3) *For fixed, land, mobile, radiolocation land and radiolocation mobile stations:* By a factor not less than 70 + 10 log (p) dB on all frequencies below 2300 MHz and on all frequencies above 2370 MHz; and not less than 43 + 10 log (p) dB on all frequencies between 2300 and 2320 MHz and on all frequencies between 2345 and 2370 MHz that are outside the licensed bands of operation;

(4) Compliance with these provisions is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or less, but at least one percent of the emission bandwidth of the fundamental emission of the transmitter, provided the measured energy is integrated over a 1 MHz bandwidth;

(5) In complying with the requirements in § 27.53(a)(1) and § 27.53(a)(2), WCS equipment that uses opposite sense circular polarization from that used by Satellite DARS systems in the 2320–2345 MHz band shall be permitted an allowance of 10 dB;

(6) When measuring the emission limits, the nominal carrier frequency shall be adjusted as close to the edges, both upper and lower, of the licensee's bands of operation as the design permits;

(7) The measurements of emission power can be expressed in peak or average values, provided they are expressed in the same parameters as the transmitter power;

(8) Waiver requests of any of the out-of-band emission limits in paragraphs (a)(1) through (a)(7) of this section shall be entertained only if interference protection equivalent to that afforded by the limits is shown;

(9) In the 2305–2315 MHz band, if portable devices comply with all of the following requirements, then paragraph (a)(2) of this section shall not apply to portable devices, which instead shall attenuate all emissions into the 2320–2345 MHz band by a factor of not less than 93 + 10 log (p) dB:

(i) The portable device has a duty cycle of 12.5% or less, with at most a 312.5 microsecond pulse every 2.5 milliseconds;

(ii) The portable device must employ time division multiple access (TDMA) technology;

(iii) The nominal peak transmit output power of the portable device is no more than 200 milliwatts (25 milliwatts average power);

(iv) The portable device operates with the minimum power necessary for successful communications;

(v) The nominal average base station transmit output power is no more than 800 milliwatts when the base station antennas is located at a height of at least 8 meters (26.25 feet) above the ground;

(vi) Only fixed and portable devices and services may be provided: vehicle-mounted units are not permitted; and

(vii) Transmitting antennas shall employ linear polarization or another polarization that provides equivalent of better discrimination with respect to a DARS antenna;

(10) The out-of-band emissions limits in paragraphs (a)(1) through (a)(9) of this section may be modified by the private contractual agreement of all affected licensees, who shall maintain a copy of the agreement in their station files and disclose it to prospective assignees or transferees and, upon request, to the Commission.

(b) *For WCS Satellite DARS operations:* The limits set forth in § 25.202(f) of this chapter shall apply, except that Satellite DARS operations shall be limited to a maximum power flux density of -197 dBW/m^2/4 kHz in the 2370–2390 MHz band at Arecibo, Puerto Rico.

(c) For operations in the 747 to 762 MHz band and the 777 to 792 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured

in watts, in accordance with the following:

(1) On any frequency outside the 747 to 762 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(2) On any frequency outside the 777 to 792 MHz band, the power of any emission shall be attenuated outside the band below the transmitter power (P) by at least 43 + 10 log (P) dB;

(3) On all frequencies between 764 to 776 MHz and 794 to 806 MHz, by a factor not less than 76 + 10 log (P) dB in a 6.25 kHz band segment, for base and fixed stations;

(4) On all frequencies between 764 to 776 MHz and 794 to 806 MHz, by a factor not less than 65 + 10 log (P) dB in a 6.25 kHz band segment, for mobile and portable stations;

(5) Compliance with the provisions of paragraphs (c)(1) and (c)(2) of this section is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed;

(6) Compliance with the provisions of paragraphs (c)(3) and (c)(4) of this section is based on the use of measurement instrumentation such that the reading taken with any resolution bandwidth setting should be adjusted to indicate spectral energy in a 6.25 kHz segment.

(d) For operations in the 746–747 MHz, 762–764 MHz, 776–777 MHz, and 792–794 MHz bands, transmitters must meet the following emission limitations:

(1) The adjacent channel coupled power (ACCP) requirements for transmitters designed for various channel sizes are shown in the following tables. Mobile station requirements apply to handheld, car mounted and control station units. The tables specify a maximum value for the ACCP relative to maximum output power as a function of the displacement from the channel center frequency. In addition, the ACCP for a mobile station transmitter at the specified frequency displacement must not exceed the value shown in the tables. For transmitters that have power control, the latter ACCP requirement can be met at maximum power reduction. In the following charts, ''(s)'' means that a swept measurement is to be used.

6.25 kHz Mobile Transmitter ACCP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACCP relative (dBc)	Maximum ACCP absolute (dBm)
6.25	6.25	−40	not specified
12.50	6.25	−60	−45
18.75	6.25	−60	−45
25.00	6.25	−65	−50
37.50	25.00	−65	−50
62.50	25.00	−65	−50
87.50	25.00	−65	−50
150.00	100.00	−65	−50
250.00	100.00	−65	−50
>400 to receive band	30(s)	−75	−55
In the receive band	30(s)	−100	−70

12.5 kHz Mobile Transmitter ACCP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACCP relative (dBc)	Maximum ACCP absolute (dBm)
9.375	6.25	−40	not specified
15.625	6.25	−60	−45
21.875	6.25	−60	−45
37.500	25.00	−65	−50
62.500	25.00	−65	−50
87.500	25.00	−65	−50
150.000	100.00	−65	−50
250.000	100.00	−65	−50
>400 to receive band	30(s)	−75	−55

12.5 kHz Mobile Transmitter ACCP Requirements—Continued

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACCP relative (dBc)	Maximum ACCP absolute (dBm)
In the receive band	30(s)	−100	−70

25 kHz Mobile Transmitter ACCP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACCP relative (dBc)	Maximum ACCP absolute (dBm)
15.625	6.25	−40	not specified
21.875	6.25	−60	−45
37.500	25.00	−65	−50
62.500	25.00	−65	−50
87.500	25.00	−65	−50
150.000	100.00	−65	−50
250.000	100.00	−65	−50
>400 to receive band	30(s)	−75	−55
In the receive band	30(s)	−100	−70

150 kHz Mobile Transmitter ACCP Requirements 12.5 kHz Mobile Transmitter ACCP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACCP relative (dBc)	Maximum ACCP absolute (dBm)
100	50	−40	not specified
200	50	−50	−35
300	50	−50	−35
400	50	−50	−35
600 to 1000	30(s)	−60	−45
1000 to receive band	30(s)	−70	−55
In the receive band	30(s)	−100	−75

6.25 kHz Base Transmitter ACCP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACCP (dBc)
6.25	6.25	−40
12.50	6.25	−60
18.75	6.25	−60
25.00	6.25	−65
37.50	25.00	−65
62.50	25.00	−65
87.50	25.00	−65
150.00	100.00	−65
250.00	100.00	−65
>400 to receive band	30(s)	−80 (continues @ −6dB/oct)
In the receive band	30(s)	−100

12.5 kHz Base Transmitter ACCP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACCP (dBc)
9.375	6.25	−40
15.625	6.25	−60
21.875	6.25	−60
37.500	25.00	−60
62.500	25.00	−65
87.500	25.00	−65
150.000	100.00	−65
250.000	100.00	−65
>400 to receive band	30(s)	−80 (continues @ −6dB/oct)

12.5 kHz Base Transmitter ACCP Requirements—Continued

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACCP (dBc)
In the receive band	30(s)	−100

25 kHz Base Transmitter ACCP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACCP (dBc)
15.625	6.25	−40
21.875	6.25	−60
37.500	25.00	−60
62.500	25.00	−65
87.500	25.00	−65
150.000	100.00	−65
250.000	100.00	−65
>400 to receive band	30(s)	−80 (continues @ −6dB/oct)
In the receive band	30(s)	−100

150 kHz Base Transmitter ACCP Requirements

Offset from center frequency (kHz)	Measurement bandwidth (kHz)	Maximum ACCP (dBc)
100	50	−40
200	50	−50
300	50	−55
400	50	−60
600 to 1000	30(s)	−65
1000 to receive band	30(s)	−75 (continues @ −6dB/oct)
In the receive band	30(s)	−100

(2) *ACCP measurement procedure.* The following procedures are to be followed for making ACCP transmitter measurements. For time division multiple access (TDMA) systems, the measurements are to be made under TDMA operation only during time slots when the transmitter is on. All measurements must be made at the input to the transmitter's antenna. Measurement bandwidth used below implies an instrument that measures the power in many narrow bandwidths (e.g. 300 Hz) and integrates these powers across a larger band to determine power in the measurement bandwidth.

(i) *Setting reference level:* Using a spectrum analyzer capable of ACCP measurements, set the measurement bandwidth to the channel size. For example, for a 6.25 kHz transmitter, set the measurement bandwidth to 6.25 kHz; for a 150 kHz transmitter, set the measurement bandwidth to 150 kHz. Set the frequency offset of the measurement bandwidth to zero and adjust the center frequency of the spectrum analyzer to give the power level in the measurement bandwidth. Record this power level in dBm as the ''reference power level''.

(ii) *Measuring the power level at frequency offsets <600kHz:* Using a spectrum analyzer capable of ACCP measurements, set the measurement bandwidth as shown in the tables above. Measure the ACCP in dBm. These measurements should be made at maximum power. Calculate the coupled power by subtracting the measurements made in this step from the reference power measured in the previous step. The absolute ACCP values must be less than the values given in the table for each condition above.

(iii) *Measuring the power level at frequency offsets >600kHz:* Set a spectrum analyzer to 30 kHz resolution bandwidth, 1 MHz video bandwidth and sample mode detection. Sweep ±6 MHz from

the carrier frequency. Set the reference level to the RMS value of the transmitter power and note the absolute power. The response at frequencies greater than 600 kHz must be less than the values in the tables above.

(iv) *Upper Power Limit Measurement:* The absolute coupled power in dBm measured above must be compared to the table entry for each given frequency offset. For those mobile stations with power control, these measurements should be repeated with power control at maximum power reduction. The absolute ACCP at maximum power reduction must be less than the values in the tables above.

(3) *Out-of-band emission limit.* On any frequency outside of the frequency ranges covered by the ACCP tables in this section, the power of any emission must be reduced below the unmodulated carrier power (P) by at least 43 + 10 log (P) dB.

(4) *Authorized bandwidth.* Provided that the ACCP requirements of this section are met, applicants may request any authorized bandwidth that does not exceed the channel size.

(e) For operations in the 746–764 MHz and 776–794 MHz bands, emissions in the band 1559–1610 MHz shall be limited to −70 dBW/MHz equivalent isotropically radiated power (EIRP) for wideband signals, and −80 dBW EIRP for discrete emissions of less than 700 Hz bandwidth. For the purpose of equipment authorization, a transmitter shall be tested with an antenna that is representative of the type that will be used with the equipment in normal operation.

(f) For operations in the 698–746 MHz band, the power of any emission outside a licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) within the licensed band(s) of operation, measured in watts, by at least 43 + 10 log (P) dB. Compliance with this provision is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kilohertz or greater. However, in the 100 kilohertz bands immediately outside and adjacent to a licensee's frequency block, a resolution bandwidth of at least 30 kHz may be employed.

(g) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

(h) For operations in the unpaired 1390–1392 MHz band and the paired 1392–1395 MHz and 1432–1435 MHz bands, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB. Compliance with these provisions is based on the procedures described in paragraph (a)(4) of this section.

(i) For operations in the 1670–1675 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB. Compliance with these provisions is based on the procedures described in paragraph (a)(4) of this section.

(j) For operations in the 2385–2390 MHz band, the power of any emission outside the licensee's frequency band(s) of operation shall be attenuated below the transmitter power (P) by at least 43 + 10 log (P) dB. Compliance with these provisions is based on the procedures described in paragraph (a)(4) of this section.

(k) When an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in this section.

[62 FR 16497, Apr. 7, 1997, as amended at 65 FR 3147, Jan. 20, 2000; 65 FR 17602, Apr. 4, 2000; 65 FR 42883, July 12, 2000; 67 FR 5511, Feb. 6, 2002; 67 FR 41855, June 20, 2002]

§ 27.54 Frequency stability.

The frequency stability shall be sufficient to ensure that the fundamental emissions stay within the authorized bands of operation.

§ 27.55 Signal strength limits.

(a) *Field strength limits.* For the following bands, the predicted or measured median field strength at any location on the geographical border of a licensee's service area shall not exceed the value specified unless the adjacent affected service area licensee(s) agree(s) to a different field strength.